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ABSTRACT

A meta analysis of 93 research reports on school desegregation and black achievement was conducted to determine (1) why the study results differed as to apparent desegregation effects; and (2) whether some desegregation plans produced greater achievement gains than others. An analysis indicated that inconsistencies in research findings were mainly due to two methodological flaws: the inability of most desegregation studies to focus on the earliest levels of schooling, where desegegation effects are most significant; and the absence of adequate control groups in most studies. Examination of reported desegregation effects showed that (1) desegregation produced greater gains for IQ scores than for achievement test scores; (2) achievement gains in successful desegregated schools were greater in reading and language arts for elementary school pupils and in science and social studies for high school students; and (3) the most successful desegregation plans were those that resulted in schools with a majority and more than a token number of blacks. Implications for theory, public policy, and educational research were drawn from the analysis. (Author/MJL)

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A RAND NOTE

DESEGREGATION PLANS THAT RAISE BLACK ACHIEVEMENT: A REVIEW OF THE RESEARCH

Robert L. Crain, Rita E. Mahard

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PREFACE

This Note represents the final report on a research grant, NIE-G-78-0150, from the National Institute of Education. It continues the authors' work at Rand on the academic effects of desegregation. An earlier report, *High School Racial Composition and Black Achievement and College Attendance*, was published by the National Center for Education Statistics of the Department of Education. A review of the desegregation-achievement literature, commissioned by the National Review Panel on School Desegregation Research with funds from the National Institute of Education and the Ford Foundation, was published as *Desegregation and Black Achievement: A Review of the Research*. The authors will next analyze the effect of desegregation on minority employment and college opportunities under a grant from the National Institute of Education for a study of the long-term effects of a desegregation plan in the Hartford, Connecticut, metropolitan area. The results will be reported in a Rand publication in 1983.

This work owes its greatest debt to the writings of Robert Yin and William Lucas of Rand and to Nancy St. John and Gene Glass. Their research made this work possible. The authors thank the librarians of The Rand Corporation for locating the literature reviewed here. They are grateful also to Shirley A. Lithgow, the project secretary, and Richard Shavelson and Gene Glass, who carefully reviewed a draft of this Note.

Rita E. Mahard was a Rand consultant at the time this Note was prepared.

SUMMARY

The voluminous research on the effects of school desegregation on minority achievement has produced little guidance for policymakers concerned with developing better desegregation plans. Several research problems have contributed to this shortcoming. The research suffered from methodological flaws, and it produced contradictory findings. Researchers argued about whether desegregation affects achievement, but failed to ask whether different types of desegregation plans have different effects.

This Note reports the results of a "meta-analysis," or case survey of 93 research reports, covering 323 samples of black students. We conducted this review in two stages, seeking to find out, first, why the findings of these studies differ as to the apparent effect of desegregation on black achievement. We isolated two methodological factors that largely explain the differing results:

1. Black students in desegregated school systems typically begin desegregation at kindergarten or the first grade. But most desegregation studies are done during the first year of desegregation of students in middle and late elementary schools, most of whom have transferred from segregated to desegregated elementary schools. According to our finding, desegregation benefits students when begun in kindergarten or the first grade, but not when begun later.
2. Many studies that we reviewed do not have an adequate control group. To compensate, researchers are forced to make statistical comparisons of treatment-control groups with techniques that bias the results and underestimate the effect of desegregation.

A multivariate analysis of the 323 samples provides estimates of the effects of these two methodological problems and of desegregation independent of these errors. Studies that avoided these two methodological errors show consistent results. We found positive effects of desegregation in 40 of 45 such studies. We conclude that the effect of desegregation, when measured properly, is a gain of about .3 standard deviations (about one grade-year).

Examining the effects of desegregation on specific types of intellectual tests, we found that desegregation enhances intelligence test performance. The typical study finds greater gains for IQ scores than for achievement test scores. Focusing on achievement test scores, we found that where desegregation raises overall achievement substantially, then reading comprehension and language arts subtest scores show a greater increase than do other subtest scores. Where achievement gains from desegregation are slight, the effect of desegreation is less for reading comprehension and language arts subtest scores than for other subtest scores. This implies that successfully desegregated elementary schools are successful because they do a good job of teaching reading and language to minority students. In high schools where desegregation is academically successful, the greatest gains are in tests that specifically measure high school skills--science and social studies.

The second phase of our research sought to find out whether some desegregation plans produce greater achievement gains than others. The 93 studies of black achievement after desegregation were used to identify the most successful types of desegregation plans. These are metropolitan plans, either voluntary or mandatory, which result in schools that have a minority, but not a small minority, of black students--in the North, schools that are 10 or 20 percent black; in the South, schools that are 10 to 30 percent black. These estimates cannot be considered precise, but they clearly imply that schools should have a majority of white students and more than a token number of black students.

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I. INTRODUCTION

The question, Does desegregation affect minority student achievement? has usually been answered in small studies, each done in a single city. No one of these studies provides a definitive answer because each contains methodological problems and each deals only with a particular kind of desegregation plan in a single city, not generalizable to other types of plans or other communities. However, a large number of these studies have been done, and this Note reviews the results of the 93 studies we were able to locate. With this many studies, we think it is possible to draw a valid conclusion about the typical effects of desegregation on minority achievement. We can also compare these studies with each other and see if particular types of desegregation plans are especially effective in raising minority achievement.

Social scientists have also used large-scale national surveys of schools to measure the effect of desegregation on student achievement. These studies are sometimes called input-output studies, with academic achievement viewed as the output of the school and the student's preschool experience, family background, etc., as the input. The first study of this sort (Coleman et al., 1966) concluded that after controlling of family background, black and Hispanic students at predominantly white schools had higher achievement test scores.

Other input-output studies have shown similar results. Bridge, Judd, and Moock (1978), in a review of the major studies, conclude that there is no relationship between white achievement and school racial composition. The studies that they review find black test performance to be higher in predominantly white schools, with one exception. Winkler (1975) found a negative effect on students who come from black elementary schools into predominantly white junior high schools, but also found a positive effect of attending mostly white elementary schools, so even this study is only partially contradictory. However, this literature involves serious methodological questions; most input-output studies, being cross-sectional, use

measures of family background as a surrogate for an achievement pretest and therefore run a considerable risk of error. These studies all use some variant of the following multiple regression equation:

$$\text{Achievement} = b_1 \text{ (family background)} + b_2 \text{ (desegregation)} + C$$

If students in desegregated schools tend to come from superior family backgrounds, the introduction of the family background term will attempt to remove the effects of this difference. The greater b_1, the more b_2 is reduced. The equation may be severely biased, however, since family background, as a surrogate for an achievement pretest, has much more error. If we assume the error to be random, it has the effect of reducing the correlation between family background and achievement, and hence overestimating the apparent effect of desegregation. In addition, nearly all of the blacks attending predominantly white schools in these studies were there as a result of "natural" rather than "artificial" desegregation. The desegregated blacks would necessarily have had to live in small cities with smaller black populations than the segregated blacks and in some cases have families who were predisposed to live in racially mixed neighborhoods. The inability of studies to control adequately on differences between school districts or control on motivation or other self-selection factors makes the results suspect.

These large-scale studies can also be used to compare the performance of minority students in various kinds of segregated and racially mixed schools, to show whether certain types of desegregated schools are superior to others. However, they have an important drawback here as well. They pool racially mixed schools that are newly desegregated with those that are "naturally" integrated--meaning that they have served an integrated neighborhood (or two adjoining segregated neighborhoods) for a long time, and the students have not gone through the experience of a formal desegregation plan. Does this make a difference? We do not know, but until we do we must be cautious about assuming that the large-scale studies will tell us useful things about how to operate a desegregation plan.

With those caveats in mind, let us consider the two main findings of the input-output studies. First, minority students in predominantly white schools score higher on achievement tests. Secondly, this seems to result not from the "whiteness" of the school but from the higher socioeconomic status of the predominantly white student body. These two findings suggest that the best desegregation plan creates predominantly white schools using white students from relatively affluent families. Two studies contribute additional findings worth consideration. Winkler (1975) found that black students who went from segregated elementary schools into predominantly white junior high schools did not experience a gain in achievement; only those from desegregated elementary schools gained. A second study (National Opinion Research Center, 1973) found that in newly desegregated southern high schools, achievement tended to be lower for black males in schools where blacks made up less than 20 percent of the student body. All of these findings are consistent with the literature that we analyze here.

The aggregation of many small-scale studies of desegregation--the alternative that we will pursue in this Note--can overcome the disadvantages of input-output analysis to some degree. Many of the studies that we use are longitudinal, and in many cases the pretest scores of desegregated and segregated black students do not differ greatly and therefore measurement error in the pretest is not as critical. These studies have the further advantage over the national input-output studies of focusing on specific desegregation plans, rather than combining all sorts of racially mixed schools together with little or no knowledge of whether they are the result of intentional desegregation.

These studies often have methodological weaknesses, however. Sample sizes are sometimes very small, some studies are weaker than others in their control of pretest scores, and others do not have a useful control group of segregated students. A fourth problem is that few of the studies deal with nonblack minority students. Although the accumulation of many small studies may represent a superior methodology, previous efforts to draw conclusions with this method have not been very successful. The studies agree on one point: Desegregation does not affect white student achievement.

St. John (1975) listed 23 studies of white achievement after desegregation, of which only five showed consistent effects (three negative, two positive). Other researchers have agreed with her. The effects of desegregation on black achievement test scores have raised considerably more debate. The first two reviews of this literature took a similar set of studies and arrived at different conclusions. St. John (1975) found that more of these studies showed achievement gains for black students after desegregation than showed achievement losses, but concluded that the studies were too inadequate and the results too mixed to infer that a causal relationship existed. Weinberg (1977) looked at many of the same studies that St. John looked at and was less cautious, concluding that desegregation improved achievement. Bradley and Bradley (1978) looked at a smaller set of studies and argued that methodological problems rendered nearly the entire set worthless. More recently, Krol (1978) carried out an analysis of a large number of studies and concluded that desegregation was beneficial. At about the same time, Crain and Mahard (1978b) reviewed 41 studies and drew conclusions similar to Krol's. While all these studies expressed concern over differences in methodology among the studies, none attempted to analyze these differences systematically.

A new methodology for analyzing these data--called "case-survey analysis" by Yin et al. (1973) and Lucas (1974) and "meta-analysis" by Glass (1978)--consists of treating each study as a data point and using other information from the study in a multivariate analysis. For example, one may analyze the effect of psychotherapy by including in the analysis a variable describing the type of therapy used (Glass and Smith, 1977) and showing that the therapeutic orientation is unrelated to success; or, one may correlate the relationship between social class and delinquency with the date of the study (Tittle, Villamez, and Smith, 1978) showing that the tendency for poor youth to be more delinquent has faded away with time.

In this study, we use this methodology to analyze the desegregation achievement literature. Our first step is to locate in each study methodological characteristics that help to explain the

disagreements among the studies. This will lead us to an answer to the first question of our research: What is the average effect of desegregation on black achievement? We will then introduce additional variables describing the character of the different desegregation plans to answer our second question: What kinds of desegregation plans are most effective in raising black achievement?

II. ESTIMATING THE AVERAGE EFFECT OF DESEGREGATION ON BLACK ACHIEVEMENT TEST SCORES

The small-scale studies of minority achievement after desegregation constitute a fugitive literature. Few have been published in journals or books. Many are unpublished doctoral dissertations, obtained through University Microfilms; others are reports of school system evaluations and papers read at the American Educational Research Association meetings, identified using the ERIC retrieval system. After a lengthy search, we located 93 studies measuring the impact of desegregation on minority achievement. These are listed in Appendix A. Because most of them dealt only with black students, we temporarily set aside those that included nonblack minorities. We excluded a large number of papers, many of which compared students in racially segregated and racially mixed schools, but gave no indication that a formal desegregation plan had been adopted. We judged that these studies would tell us little that the more sophisticated large-scale studies like the Coleman report had not already shown. We also dropped a few studies where the research design seemed seriously deficient. For example, we discarded studies that compared the achievement of black students in desegregated schools with black students in segregated schools without verifying that the two groups of students were of similar background or had similar test scores prior to desegregation.

The 93 studies formed a mixed bag, and their results were equally mixed. Following a procedure suggested by Glass (1978) for meta-analyses, we divided many of the 93 studies into separate subsamples of students, entering each as a separate study in a computer-readable file. A single research report might contain a number of separate samples: students of different ages, students who had been in desegregated schools for different periods of time, or students whose achievement was monitored using different methodologies. In all, 323 samples of students were identified.

Since we planned to analyze the size and direction of these effects over a number of studies, we had little interest in whether any particular result was statistically significant in itself. Our overall sample contains a slightly smaller proportion of positive findings than do either St. John (1975) or Krol (1978). Slightly over half of the samples showed an increase in achievement after desegregation; the remainder were divided between samples in which pupils showed no change and those in which pupils lost ground in achievement.

Many complex studies provided several possible ways to measure the treatment effect. For example, a study reporting mean test scores for both blacks and whites in several grades for several years could be analyzed by looking at the black gain in achievement relative to national norms, relative to the achievement of white students, or relative to the achievement of a cohort of blacks taken from before desegregation. Whenever such a choice presented itself, we selected the design that seemed least biased, as described below. Each study, read by both authors, took about three person-hours to code. In many cases, the data were reanalyzed.

STUDY METHODOLOGY

The effect of desegregation on black achievement was defined as the increase in achievement obtained by desegregated students beyond that which would be expected had they remained in segregated schools. This meant comparing desegregated students to some control group, usually a group of segregated black students, but sometimes a group of white students in the same community or simply the test manufacturer's norming sample.

In assessing the methodology of a study, we must ask two general questions: first, Are the desegregated students typical of students experiencing desegregation? and second, How can one best estimate what their achievement performance would have been in the absence of desegregation? Many of the studies that we reviewed had problems with both of these issues.

Most studies of desegregation were done almost immediately after the desegregation plan was put into effect. Therefore, the students did not represent graduates of desegregated schools; they were still in school in nearly every case, and in a number of cases they began desegregation not at kindergarten or first grade but after they had already attended segregated schools. Thus, their experience is not representative of a future cohort of students who would experience 12 or 13 years of desegregation by the end of high school. Many critics have commented on the unfairness of evaluating desegregation prematurely, when the students have spent only one or two years in desegregated schools. However, critics have not paid attention to the other side of that issue--the fact that many of these students began desegregated schooling after first attending segregated schools.

Choosing a comparison group sometimes presents a difficult problem. When every school in a community is desegregated, no minority students remain in segregated schools to serve as a comparison group. Although a variety of makeshift solutions may be used in this circumstance, none is completely satisfactory. Even when some schools remain segregated, the problem of deciding whether the segregated and desegregated minority students are truly similar is a difficult one. If one of the two groups comes from a more affluent background, their test scores will normally be higher. Statistical procedures to correct for this bias are inadequate (Reichert, 1979).

We attempted to separate the genuine effects of desegregation from the false effects created by the methodological decisions made in an effort to deal with these two general issues. To determine the bias introduced by incomplete treatments, we recorded a variety of dates--when the students were desegregated, when they were posttested, and if the design was longitudinal, when they were pretested. From this we could determine the number of years in segregated schools before beginning desegregation and the duration of desegregation at the time achievement effects were estimated. This knowledge enabled us to determine whether treatment effects were consistently misestimated when students experienced only a partial treatment. In like manner, we determined what method was used to compare the desegregated

students with a control group, to determine whether the use of a weak methodology biased the estimate of the treatment effect.

CATEGORIZING STUDIES BY CHOICE OF CONTROL GROUP

We found that we could separate the studies into seven general categories according to the type of methodology used to create a comparison between desegregated and segregated black students. We then ranked the seven strategies according to our best judgment about their relative effectiveness.

Longitudinal, Random Assignment

The standard for scientific research is the experimental design with random assignment to treatment and control groups. It is widely assumed that such designs are politically or ethically impossible in educational research, but in fact four such studies have been made. In all four cases, segregated black students voluntarily transferred from central city schools to a white suburban school district. Ethical issues of who should be entitled to treatment did not arise because the number of students who would have volunteered for the program far exceeded the number of students the suburbs would have accepted.

In Hartford (Mahan and Mahan, 1971) and New Haven (Samuels, 1971), students were selected by lottery first and then their parents were contacted to obtain their consent. In Hartford, 96 percent of the contacted parents agreed to have their children assigned to suburban schools. In Rochester, New York, Rock et al. (1968) adopted a more conventional strategy, recruiting a list of volunteers and then randomly selecting from that list until the suburban quota was filled. Zdep (1971) carried out a similar study in Newark, New Jersey. Owing to the fact that these four districts were studied by several authors at different times, they provide 7 percent of the samples in our study.

Longitudinal, Justified Black Control Group

In most other studies, a control group of segregated black students was used, but without random assignment. Comparability of the

treatment and control groups was based on pretest scores for each. The possibility remains, however, of important differences between the treatment and control groups, differences that do not appear on the pretest but might correlate with posttest scores. This means that any technique used to adjust for pretest differences will introduce error (Reichert, 1979). In a few studies, however, we can have more confidence in the comparability of the treatment and control groups, because the description of how the two groups were selected indicates that geographic factors were of overriding importance and these factors did not allow much room for self-selection. Personal motivation or other respondent characteristics could not play a large role.

Schellenberg and Halteman (1976) showed not only that students selected to be transferred from all-black schools to desegregated schools had pretest scores similar to those not selected, but that they were selected if and only if they lived some distance from their neighborhood school. Students who lived closer to the neighborhood school remained in it. They argue (to us, convincingly) that the families who lived five blocks from a neighborhood school cannot be expected to differ in any important way from those who live only one or two blocks away from the school. In other cases, control groups for students voluntarily desegregating themselves were selected from a waiting list, or more complex systems were used to select a control group so that one could have some confidence that self-selection bias and unmeasured family characteristics would not bias the study. We placed 8 percent of all the samples in this category.

Longitudinal, Nonrandom Controls

Unfortunately, relatively few studies justified their choice of control group by reporting the method of assignment to segregated or desegregated schools. Most contented themselves with selecting as a control group the students in a black segregated school whose pretest scores were similar to those of the desegregated students; 41 percent of the samples are of this type. This design leaves open the question of why one group of students was desegregated and not the other and unless the question is answered, one cannot have total confidence

in the treatment-control comparison, despite a good match on pretest scores.

Many of the studies are of voluntary plans, where there is a serious possibility of self-selection bias. This is especially true if the volunteers represent only a small fraction of the total student population available. Students attending desegregated schools are more likely to have parents who are interested in desegregation, or interested in their children's school performance, or simply more likely to have heard about the plan. Various tricks have been used to match students to an artificial control group under these circumstances, but none of the techniques is infallible. Walberg (1971) and Armor (1972) each evaluated the Boston METCO Plan, using siblings of transferred students as the control group. The argument for sibling matching is that it controls well on home environment factors and on the genetic pool. But this may not be a good solution, because sibling controls maximize the possibility of self-selection bias. If parents bus one of their children but not another, they do so because of feelings about the differences between their children. We do not know whether the child most likely to succeed in school or the child having the most difficulty in school was usually selected. But whatever the case, a bias has been introduced.

Cross-Sectional, Black Controls

In many studies, a control group was identified without using a pretest to verify comparability. A careful reading of five of these reports indicated that there was some reason to believe that the comparison was reasonably well controlled; the others were excluded from the review. Only 6 percent of all samples were cross-sectional comparisons between desegregated and segregated black students.

Each of these three study designs--longitudinal with a justified black control group, longitudinal with nonrandom black controls, and cross-sectional with black controls--is inferior not because it introduces bias in a known direction, but because it can introduce either positive or negative biases into the study and thus reduce the overall reliability of the results. A worse problem arises, however, in

trying to study communities in which all schools are desegregated and no black students remain in segregated schools to be used as a control group. In the three study designs under these conditions discussed immediately below, there was reason to believe not only that the design introduced error, but that the error systematically worked against showing a positive desegregation effect.

Cohort Comparisons

The best choice in the absence of a segregated control group, a choice used in 17 percent of our samples, is to compare the performance of desegregated black students in a particular grade with black students in the same grade before desegregation. This practice is commonly used by school districts with access to overall test scores for black students for each grade year. The major drawbacks of this practice include the possibility that the test and the conditions of administering it may have changed and, more important, the fact that between 1960 and 1975 test scores declined nationally. Unless there has been a drastic population shift in the community, the students in the two cohorts come from similar family backgrounds. But even so, the later cohort of students often have lower scores, simply because test scores were declining nationally when many studies were done. Thus, the studies underestimate the effects of desegregation.

Longitudinal, White Control Group

Another alternative is to compare the growth in achievement of desegregated black students to that of desegregated white students for the same period of time. This has the advantage that the control group has received the same tests administered under more-or-less the same testing conditions. However, as is well known, the achievement gap between blacks and whites widens throughout the middle of elementary school, the most common time period for these studies. Thus, if desegregation had no effect, it would appear to have a negative effect simply because of the normal widening of the gap. Only 9 percent of our studies fall into this category.

Longitudinal, Test Norm Sample Comparison

The weakest design simply compared the growth in achievement for black students with the expectations published by the test manufacturer. The weakness stems from the fact that the norms for all tests are based on white students, and black students may be expected to fall further behind grade level as they progress through elementary school. This design is even worse than that using the white students in the same district as a control, because of the lack of controls on conditions of test administration and on the special characteristics of the curriculum used in the district.

CODING THE ACHIEVEMENT EFFECTS OF DESEGREGATION

Following Glass's formulas (see Glass, 1978, and Glass and Smith, 1979), we coded the difference between segregated and desegregated students' test scores in units of the test standard deviation for the control group: $d = (\bar{x}_t - \bar{x}_c)/s_c$. We were able to do this for 268 of the 323 samples. In many cases, the control group's standard deviation was reported and the computation could be carried out directly. In a number of other cases, mean treatment and control group scores were reported in percentiles on a national distribution. We assumed the distribution to be normal, with the control group standard deviation equal to that of the norming sample, and converted the result to standard deviation units.

Some studies reported results with an analysis of variance, which could be analyzed to determine the size of the difference between treatment and control means and to estimate the standard deviation of the pooled treatment and control samples, which we assumed to be equal to the control group standard deviation. Nearly all of the 55 samples for which no magnitude estimate could be made were studies that reported results with an analysis of covariance but did not report the correlation between pretest and posttest, so that one could not recover estimates of the test standard deviation. When several subtests were reported or when both achievement and IQ were reported, the differences obtained for each type of test were computed and averaged. Where IQ test scores were reported, we assumed a control group standard deviation of 15 points.

A number of the studies posed a special problem because the scores were reported in grade equivalents, with no standard deviation measure given. We converted the grade equivalents to standard deviation units using the national norms from the *Comprehensive Test of Basic Skills* (CTBS).* While the *CTBS* is one of the most commonly used tests in our study and two properly normed tests should have identical grade equivalent/standard deviation ratios, in practice assuming a constant grade equivalent/standard deviation relationship across different tests is problematic and has no doubt introduced error into our estimates.

We also coded simple direction of effect: positive, zero, negative, for 321 samples. (Two samples were omitted because the authors reported only that the differences were not statistically significant without indicating whether they were positive or negative.) Since the sample sizes varied greatly, we decided that whether results were statistically significant or not was irrelevant in terms of an overall synthesis. (Of course, a sign test applied to the entire 321 samples would give an overall positive result.) A study was coded as showing no effect of desegregation only if the difference due to desegregation was estimated to be less than .04 standard deviations or less than .1 grade years.

Our results are somewhat less favorable to desegregation than those of other reviewers. Positive achievement gains outnumbered achievement losses by a ratio of 1.6:1 (of the 323 samples, 173 showed positive achievement results, 50 showed no difference as a result of desegregation, and 98 showed losses). St. John (1975), Weinberg (1977), and Krol (1978) found positive results outnumbering negative results by about three to one. These other reviews use a more generous rule for defining zero effects, allowing all nonsignificant results to be classified as zero. Our results also differ because the studies

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*Standard deviations or the norming sample and tables converting raw scores and standard scores to grade equivalents are given in *Comprehensive Test of Basic Skills* (no date).

yielding positive results tend to have fewer separate samples of students, so that counting each sample separately makes the overall results less favorable. Our sample of studies also differs from theirs.

The measures of effect in standard deviation units had an overall mean of .08 standard deviations gained, with a standard deviation of .24. This result is slightly smaller than that obtained by Krol. It is based on only 264 samples, with four very extreme results (two positive, two negative) discarded from the study, and 55 samples uncodable.

THE EFFECT OF METHODOLOGY

The four randomized experiments all showed positive achievement effects, usually quite a bit larger than the average obtained in all the studies combined. This, combined with the fact that more studies showed positive desegregation results than negative and the fact that some of the designs were known to be biased against a treatment effect, led us to hypothesize that the stronger the design, the more likely the treatment effect was to be positive. As Table 1 shows, our hypothesis is supported by the data. Eighteen of 21 samples (86 percent) taken from studies based on random assignment showed positive achievement results, while at the other extreme, over half the studies that compared black performance with white performance or with national norms showed negative results of desegregation.

The four intermediate categories are not as neatly ranked, although the longitudinal-justified design seems to produce fewer negative results. A priori, we do not expect designs 2, 3, and 4 to yield smaller mean treatment effects than a randomized experiment, since we would expect positive error to appear as often as negative. The four studies using experimental designs are all studies of central city-to-suburb voluntary plans, which may represent an academically superior form of desegregation; alternatively, a negative bias may consistently appear when nonrandom control groups are used. (A priori, we do expect experimental designs to show more positive outcomes when only the sign of the outcome is considered. If

Table 1

DIRECTION AND SIZE OF TREATMENT EFFECT
BY TYPE OF CONTROL GROUP

Design	Direction of Effect				Size of Effect	
	+	0	-	(n)	d	(n)
1. Longitudinal, random	86	5	10	(21)	.226	(9)
2. Longitudinal, justified	48	39	13	(23)	.072	(14)
3. Longitudinal, nonrandom	57	16	27	(118)	.046	(76)
4. Cross-sectional	62	13	26	(39)	.083	(15)
5. Cohort	53	16	31	(64)	.105	(101)
6. White controls	33	8	58	(12)	.044	(10)
7. Norm controls	34	11	54	(44)	-.028	(34)
Total	54	16	30	(321)	.069	(258)

desegregation normally has a positive effect, experimental designs should show fewer negative or zero effects, because they presumably have less error that would make positive treatments appear not to be positive.)

Many critics are also concerned that these studies are normally carried out over a short period. The effects of desegregation are usually evaluated at the end of the first year of desegregation, sometimes at the end of two years, but rarely after a longer period. These critics have argued that premature evaluation tends to underestimate the effects of treatment. We coded a variety of dates--when desegregation occurred, when students were pretested, and when they were posttested. Surprisingly, we did not find that the duration of desegregation at posttest was related to the effect measured. We did, however, find another related time factor, namely, the grade at which students were first desegregated.

In most desegregation plans, desegregated schooling begins at kindergarten or the first grade. (Sometimes kindergarten is omitted because of the logistics of transporting children for only half a day

of schooling; a small number of school districts, the most important being Dallas, leave the early primary grades segregated so as to avoid what is seen as a hardship for very young children.) However, studies of the effects of desegregation are usually done immediately after desegregation begins. When this happens, desegregation is evaluated by testing students who began desegregation later than the first grade. It appears that this methodological decision introduces considerable error into the evaluation (see Table 2). The 295 samples for which data are available have been divided by the grade at which students first experienced desegregation. Studies of students who were desegregated at kindergarten or first grade are more likely to show positive results of desegregation, much less likely to show a negative result, and show a higher mean treatment effect. At the other extreme, samples of students desegregated in fifth grade or later show positive effects only half the time and an average effect size near zero.

Table 2

DIRECTION AND SIZE OF TREATMENT EFFECT
BY GRADE AT INITIAL DESECREGATION

Grade at Desegregation	Direction of Effect				Size of Effect	
	+	0	-	(n)	d	(n)
Kindergarten	100	0	0	(11)	.446	(15)
1	77	7	16	(44)	.189	(46)
2	56	8	36	(36)	.020	(30)
3	50	26	24	(54)	.052	(30)
4	53	21	26	(38)	.032	(29)
5	44	8	49	(39)	-.003	(25)
6	52	8	40	(25)	-.008	(23)
7-9	56	16	28	(25)	.007	(29)
10-12	48	22	30	(23)	.001	(27)
Total	56	14	29	(295)	.076	(247)

Table 3 combines the effect of methodology and grade at initial desegregation, showing the percentage of samples that yielded positive results at each grade of initial desegregation and with each type of design. To simplify the table, we collapsed the two nonrandom longitudinal designs with black control groups, combined the small number of cross-sectional samples with the cohort designs, and combined samples that used white student achievement as a control group with those that used test norms. All 11 samples of students desegregated at kindergarten show positive effects of desegregation. Similarly, a high percentage of the samples of students desegregated in the first grade show favorable results. In general, the studies that used randomized experiments were somewhat more likely to find positive results in the upper elementary school grades, and the norm-referenced studies were least likely to find positive results. To summarize the

Table 3

PERCENTAGE AND NUMBER OF SAMPLES SHOWING POSITIVE DESEGREGATION OUTCOMES, BY GRADE AT WHICH STUDENTS WERE DESEGREGATED AND RESEARCH DESIGN

Design	Grade of Desegregation					Row Average and Total (n)
	K	1	2-3	4-6	7+	
Random experimental						
Percentage	100	100	71	60	--	81
(n)	(1)	(8)	(7)	(5)		(21)
Longitudinal						
Percentage	100	73	46	62	69	59
(n)	(2)	(11)	(46)	(39)	(29)	(127)
Cohort comparison or cross-sectional						
Percentage	100	78	56	40	45	56
(n)	(5)	(23)	(25)	(37)	(11)	(101)
Norm-referenced or white controls						
Percentage	100	0	43	37	0	35
(n)	(3)	(2)	(14)	(19)	(8)	(46)
Column average	100	77	50	49	52	56
Column total (n)	(11)	(44)	(92)	(100)	(48)	(295)

data in a different way, we identified 45 studies that had a black control group in either a longitudinal or cohort design and began desegregation in kindergarten or first grade; 40 of the 45 showed a positive effect of desegregation.

ESTIMATING THE MAGNITUDE OF THE TREATMENT EFFECT

Having identified two methodological factors that influence the magnitude of the treatment effect reported in these studies, our remaining task is to estimate the expected treatment effects when the best possible study design is used. We computed equations regressing the achievement effect of desegregation on grade at first desegregation (transformed by an arctangent function to correct for the curve apparent in Table 2, above) and with the seven design categories entered as six dummy variables. The unstandardized regression coefficients are shown in Table 4. We also computed the regression equation once unweighted, once weighted by one-tenth of the square root of the treatment sample size for each sample (so as to discount very small samples), and once weighted so that each author's work will carry a cumulative weight of 1 (which serves to discount studies that produce a large number of separate samples and otherwise would carry much more weight than studies of a single sample). These six regression equations serve two purposes: They permit us to determine the effect of each of the seven designs, thus checking our overall ranking of the seven; they also provide us with an estimate of the expected treatment effect under optimal design conditions.

Grade at desegregation is significantly related to the magnitude of the treatment effect and, in two of three cases, to direction of effect. The dummy variable representing the longitudinal nonrandom design is omitted so that the other six designs are measured relative to it. We find that the random experiment always has the largest positive coefficient and in one case is significantly more positive than the longitudinal nonrandom design. The longitudinal design with justified control group has the second-largest coefficient in five cases. In five of six cases, the cross-sectional studies give less positive results than the longitudinal nonrandom studies. Cohort

Table 4

EFFECT OF TYPE OF CONTROL GROUP AND GRADE AT DESEGREGATION ON ESTIMATE OF TREATMENT EFFECT

	Size of Effect			Direction of Effect		
	Weight			Weight		
	None	$.1\sqrt{n}$	Study	None	$.1\sqrt{n}$	Study
Dependent variable						
Mean	.080	.069	.104	.234	.169	.291
Standard deviation	.236	.221	.252	.890	.904	.872
Independent variables						
Grade at desegregation[a]	-.274[b]	-.326[b]	-.226[b]	-.616[b]	-.877[b]	-.473[b]
Design variables						
Longitudinal, random	.074	.077[b]	.071	.306	.339	.438
Longitudinal, justified	.005	.015	-.006	.048	.195	.188
Longitudinal, nonrandom	(c)	(c)	(c)	(c)	(c)	(c)
Cross-sectional	.005	-.010	-.026	-.045	-.091	-.125
Cohort	-.030	-.017	.006	-.159	-.203	.177
White controls	-.006	.005	-.004	-.510[b]	-.490[b]	-.475
Norm controls	-.134[b]	-.133[b]	-.124	-.552	-.645[b]	-.459
Constant	.424	.468	.389	1.075	1.342	.893
Multiple R	.434	.561	.344	.344	.420	.360
(n)	(252)	(247)	(70)	(295)	(292)	(88)
Estimated treatment effect, random design, first grade	.283	.289	.283	.897	.992	.956

[a] Arctangent transformation.

[b] $p < .05$, one tail.

[c] This dummy variable was omitted.

designs show mixed results, usually more negative than the nonrandom longitudinal design but sometimes more positive. The studies using white control groups are much less likely to show positive treatment effects, but the overall mean treatment effect is not particularly low. The studies using national norms in lieu of a control group have negative effects on both the magnitude of the effects and their direction. The multiple R increases considerably when the studies are weighted as a function of sample size.

The failure of the studies using white control groups to show a significant negative bias prompted us to reexamine these studies, which usually reported enough data to permit defensible analysis methods. If the data were available, we preferred to measure the "gap" between black and white achievement in terms of white standard deviation units rather than grade equivalents, because when standard deviations are used, the gap does not greatly increase with age and consequently does not swamp the treatment effect. In contrast, the studies using the test norm sample as the only control group usually report simply the pretest and posttest scores in grade equivalents, a method that does not allow much leeway in the analysis.

The last row of Table 4 shows the estimated treatment effect assuming the best possible research design. We assume that desegregation began at first grade, with random assignment to segregated and desegregated schools. We did not assume desegregation beginning at kindergarten because a large number of desegregation plans do not desegregate kindergartens. When these assumptions are made, we find that the expected treatment effect is about .3 standard deviation, regardless of which weighting is used for the equation. This appears to be a large effect. In the upper elementary school grades a standard deviation unit is equal to two to three grade years; in the lower primary grades a standard deviation is a smaller number of grades. A typical student of below-average performance who moved up one standard deviation would move from the 17th percentile to the 50th, and his IQ would increase from 90 to 105. Thus, a gain of .3 standard deviation is a gain of three-quarters to one grade year, or five IQ points. Regardless of the weighting used, our estimate of the percentage of

all studies showing positive treatment effects is over 90 percent. (Note that 94 percent positive, 2 percent zero, 4 percent negative would yield a mean directional effect of .94 - .04 = .90.)

This estimate may overstate the treatment effect by assuming that the positive regression coefficient associated with a randomized design compared with a nonrandom black segregated control group is valid. A priori, a nonrandom control group should introduce greater error into the estimate of the treatment effect, but the effect is as likely to overestimate the true treatment effect as to underestimate it; this would explain why nonrandom designs produce fewer positive findings, but would not explain why the overall mean is lower for these studies. Nonetheless, the fact remains that the randomized experiments yield a higher mean, and the technically best study of those we surveyed (Zdep, 1971) produces a treatment effect for first graders which is so large that we have excluded it as an outlier. Some unknown negative bias may explain the lower treatment results resulting from nonrandom designs.

In the course of doing this analysis, we were able to identify the methodologically strongest studies. We found 23 studies which dealt with students desegregated at either kindergarten or first grade and which used black students in a segregated school as a control group or compared scores to those of a previous cohort. These 23 studies involved 45 samples of students participating in 19 desegregation plans in 18 cities (two desegregation plans, a decade apart, were studied in Nashville). Forty of the 45 samples show positive effects, and of those for which a size of effect could be estimated in standard deviations, the median effect of desegregation was to raise achievement by a quarter of a standard deviation.

A NOTE ON BIAS IN PUBLICATION DECISIONS

One possibility must be considered: The effect of desegregation on black achievement may appear to be favorable only because unfavorable research results are suppressed. To test for this possibility, each study was coded for occupation of author, source of funding, and form of publication. If a general prointegration bias

were influencing publication decisions, we would expect doctoral dissertations and unpublished research reports to show less favorable results than published books and articles. However, there are no significant correlations. No doubt scientists have made ideologically motivated publication decisions, but either they fall equally on both sides of the busing controversy, or they are swayed by a larger number of decisions that are made on objective grounds. No doubt "publish or perish" and the need to be reimbursed for convention expenses also work to reduce bias by encouraging publications or presentations.

DESEGREGATION AND HISPANIC ACHIEVEMENT

Our review revealed little research on the effect of desegregation on the achievement of Hispanic students. The desegregation of such cities as Los Angeles, with large Mexican-American and other Hispanic populations, suggests the desirability of expanding our perspective to include these minorities.

The research seems to indicate that blacks benefit from desegregation, but it does not seem obvious that other minorities will be similarly affected. Given the diversity among Hispanics, there also seems to be little reason to expect a consistent effect among different Hispanic groups.

To fill this gap in this research, we carried out an input-output study correlating Hispanic achievement and school ethnic mix, using data on high school graduates from the National Longitudinal Study of 1972 (Mahard and Crain, 1980). We found Hispanic achievement higher in desegregated schools. This agrees with the Coleman report, which found the effects of school racial mix to be stronger for Hispanics than for blacks. We also found one technically adequate study of a specific desegregation plan, which also showed a positive effect of desegregation. A description of this study, and the report of our input-output study, appear in Appendix B.

Thus, the evidence of the effects of desegregation on Hispanic students remains weak; but what evidence there is supports the view that Hispanics, like blacks, benefit academically from desegregation.

DESEGREGATION AND PERFORMANCE ON INTELLIGENCE AND SPECIFIC ACHIEVEMENT TESTS

Nearly all research on the effects of school characteristics in general, and of desegregation in particular, have focused on achievement as a global outcome. In most of the studies we have analyzed, achievement means the total score of a test battery. If an intelligence test was also administered, we treated it as another type of subtest, and averaged its result in along with reading, language, arts, arithmetic, and science.

After we completed the analysis of achievement, we looked again at the individual subtest scores to see if desegregation tended to affect scores in any one area more or less than in others. We found no simple results: For example, desegregation does not affect reading scores more than mathematics scores. We did find some more complex interaction effects regarding reading and language skills, and we found, to our considerable surprise, that desegregation has its greatest positive effect on intelligence test scores.

Intelligence Test Performance in Desegregated Schools

The largest gains as a result of desegregation appear consistently on tests of general intelligence. When we transformed intelligence tests and achievement subtests to the same metric, we found that increases in IQ scores after desegregation generally outrun performance on all subareas of standard achievement tests. In 29 cases where a researcher administered both an IQ test and an achievement test to the same students, the effect of desegregation on IQ was greater than the average on the other subtests in 16 cases, the same in 8, and less than the average in only 5 ($p < .05$ by sign test).

This finding flies in the face of the traditional view of the distinction between intelligence and achievement. Achievement tests presume to measure things taught by schools; if achievement test scores are higher in one school than in another, this presumably implies that one school has a superior learning environment. But tests of intelligence are designed to be as curriculum-free and as environment-free as possible. They presumably test raw abilities

that predict how a student will perform in school rather than measure the outcome of schooling itself.

This traditional view has been questioned, and scientists believe school characteristics affect intelligence just as they affect achievement. Nevertheless, it is still surprising to find school desegregation affecting IQ more strongly than achievement. In our research, we read 12 studies evaluating the effect on desegregation on intelligence test scores. We review these in Appendix C.

Reading and Language Arts Skills

To further understand the effect of desegregation, we looked at achievement test performance on each subtest of the achievement batteries administered in the 93 studies. Where separate subtest gains were reported, we found an interesting pattern. Averaging all the samples of desegregated students together reveals that desegregation increases each subtest about equally. (There is a slight tendency for mathematics gains to be greater than reading gains, but the difference is small and not significant.) However, when we looked separately at those samples of students who showed losses or small gains in achievement after desegregation, we found that their scores in the reading comprehension subtest lagged behind their scores in mathematics, spelling, and vocabulary. In school districts where students experienced greater gains than normal, reading subtest scores outpaced the other subtest scores. The results appear in Table 5.

Because reading comprehension is a critical element in achievement test performance, a good score in achievement requires a high level of reading performance, and minority students come into desegregated schools with difficulties in reading comprehension. This suggests that in schools that are unable to provide reading aid, students will not be helped by desegregation, while in those that make a special effort to deal with reading problems, desegregated students will benefit from the entire curriculum and score well on all parts of the test. The language arts subtest scores show the same pattern in Table 5: low scores in schools where students do not benefit much from desegregation, high scores where they do. This suggests that a desegregated school must make special efforts to work with language

Table 5

EFFECT OF DESEGREGATION ON ACHIEVEMENT WHEN SPECIFIC SUBTESTS LEAD, MATCH, OR LAG BEHIND OTHER SUBTESTS IN THEIR DESEGREGATION EFFECT

	Overall Achievement Gains Resulting from Desegregation			
	Unusually Large	Average	Unusually Small	
Reading subtest gains compared with all other subtest gains				
Greater	42%	24%	31%	
Same	19	14	26	
Smaller	40	62	44	
Total	101%	100%	101%	
(n)	(81)	(37)	(62)	
p[a]				n.s.
Language subtest gains compared with all other subtest gains				
Greater	31%	31%	23%	
Same	38	15	15	
Smaller	31	54	62	
Total	100%	100%	100%	
(n)	(29)	(13)	(13)	
p[a]				<.05
High school subject subtest gains compared with all other subtest gains				
Greater	50%	80%	11%	
Same	25	20	44	
Smaller	25	0	44	
Total	100%	100%	99%	
(n)	(4)	(5)	(9)	
p[b]				<.05

[a]Chi-square on 2 x 2 table.

[b]Chi-square on 2 x 2 table, with Yates's correction.

problems, perhaps related to the need to learn standard English grammar. We are cautious in making a policy recommendation on the basis of a single analysis, but we believe that additional research on the relationship of desegregation to various areas of achievement is likely to be quite valuable.

Secondary School Subject Tests

The few studies of secondary school desegregation which reported performance on tests in subject matter showed an interesting pattern. In secondary schools where minority students benefited little from desegregation, their performance in subject tests--science, history, etc.--lagged well behind their performance in reading and mathematics. In schools where achievement gains were large, it was greatest in these subject tests (see Table 5). This result agrees with the findings of the Crain, Mahard, and Narot (1982) study, which argued that the overall social climate of the secondary school was critical for minority student performance. If a bad racial climate inhibits the academic motivation of black students, this effect should appear most strongly in those tests that measure material specifically taught in secondary school classes. Overall reading and math performance, much of which is carried forward from earlier grades, is not affected as much by the negative social climate that inhibits learning. Put more simply, a negative secondary school racial climate does not make black students forget the basic skills they learned in elementary school, but it hinders their learning new material in the courses they take. This result must be considered tentative because of the very small number of studies involved.

III. THE ACHIEVEMENT BENEFITS OF DIFFERENT TYPES OF DESEGREGATION PLANS

We now come to the heart of this exercise. Having removed the extraneous effects of differences in methodology from the results of the 93 studies of black achievement, we are in a position to inquire whether certain kinds of desegregation plans seem to have stronger effects on desegregation than others.

We used the unstandardized regression coefficients shown in Table 4 (see p. 20, above)--the weighted equation with size of effect as the dependent variable--to compute an expected achievement gain (y) for each sample of students in our review. We then computed the residual achievement gain or loss for each sample and correlated these residuals with characteristics of the desegregation plans in each community.

One important finding is that the metropolitan desegregation plans analyzed show stronger achievement effects than others studied. Table 6 shows, for students in metropolitan and other types of desegregation plans, the expected gain due to desegregation, based on

Table 6

EFFECT OF DESEGREGATION, BY TYPE OF SCHOOL DISTRICT SETTING

	Mean Effect[a]	Number of Samples
Central city	.285	(97)
Suburb	.241	(76)
County-wide	.339	(31)
Metropolitan	.364[b]	(30)

[a] Standard deviation units.

[b] Difference between central city and metropolitan plans significant by two-tailed test, $p < .05$.

residuals computed from the regression equation in column 2 of Table 4. Thus, the expected gains are statistically adjusted to eliminate differences in methodological quality and the effects of desegregation at later grades. The grand mean for the residuals is zero, and can be thought of as the amount added to the "normal" desegregation effect by type of district. Since we estimate that the average gain for the technically adequate study--a randomized experimental evaluation of students desegregated at first grade--is .3 standard deviations, we added .3 to each residual, so that Table 4 would show the expected true effects of desegregation.

Studies in suburbs and in central cities show weaker effects of desegregation than metropolitan studies. Lying between the two is the results of studies made in county-wide school systems, which are common in the South. A county-wide system is a kind of metropolitan desegregation plan, but different in the sense that desegregation does not involve the reassignment of black students to schools that were traditionally administered by a school district serving only suburban students. Thus, it is a different form of metropolitan desegregation and shows results similar to the plans that are normally referred to as metropolitan in nature.

Why should metropolitan desegregation plans show stronger desegregation effects? There are two plausible explanations, although neither can be tested with these data. The first is that metropolitan desegregation represents the most complete form of socioeconomic desegregation. Minority students from low-income central city neighborhoods are reassigned to suburban schools in affluent areas. If the plan were limited only to the central city, the number of middle-class white students available would be sharply reduced. By the same argument, desegregation within suburban schools might be relatively ineffective because the minority children living in suburban ghettos would not be as poor as those living in central cities--thus improvement to the same level of achievement in desegregated schools would not be as marked a gain for them, since their performance in segregated schools would already be fairly high. This hypothesis would explain why county-wide plans would be nearly as effective as

other kinds of metropolitan plans, since both would involve the full range of socioeconomic differences in the area.

A second explanation, having to do with the administration of school districts, argues that suburban school districts, spared the conflict and tension that surround the operation of many central city school districts, have been able to recruit stronger teaching staffs and better principals and provide a more effective administrative environment for their schools. Once a metropolitan school district is created or minority students are reassigned to suburban schools, these schools are able to maintain their stronger academic traditions. This hypothesis does not agree with Natkin (1979), which found that black students bused to the suburbs of Louisville, Kentucky, did no better on achievement tests than those who remained in the newly desegregated inner-city schools. Had there been a strong difference in the quality of teaching or administration in the two kinds of schools, one would have expected the bused students to do better.

The suburban Louisville schools were affected by staff desegregation as well as student desegregation. Intuitively, we would expect this to have both negative and positive effects on black students in suburban schools. They would be harmed by the dislocation of teaching staffs and the high turnover of staff in these schools. At the same time, they would probably benefit from the presence of more black teachers in the suburban schools. In this sense, we would expect formal metropolitan desegregation plans involving the merger of suburban and central city districts to be more effective in the long run than voluntary plans which sometimes leave virtually all-white teaching staffs in the suburban schools serving the inner-city minority transfer students.

Metropolitan plans can be based on either voluntary or mandatory desegregation. Our review located studies of northeastern metropolitan plans in Hartford and New Haven, Connecticut, Newark, New Jersey, and Rochester, New York. All involved the voluntary transfer of black students from inner-city schools to suburban schools and were all evaluated with experimental designs. In these cases, the number of students willing to attend suburban schools far exceeded

the number of spaces available to them, so that students were chosen by lottery. When those students selected for the plan were compared with those who were not, in every case sizable achievement gains were reported.

Mandatory metropolitan plans result from the merger of suburban and central city school districts. In this data set we have only one example--the Nashville-Davidson County public schools were merged and desegregated shortly thereafter, and a study showed sizable achievement gains for black students. Another study, which we located too late to be entered into our computer file of studies, involved the consolidation of the Louisville city and suburban districts in 1975. The newly formed Jefferson County school system compared the performance of fifth grade black students in 1978 with those in the fifth grade in 1975, when desegregation began; it found that black students' overall performance had risen from the 25th percentile nationally to the 33rd percentile. At the same time, white students rose from the 50th percentile to the 54th (*Louisville Times*, 1980). Older students, who were desegregated after starting school in segregated classes, did not show these striking gains. The other major metropolitan desegregation plan, in Newcastle County, Delaware, merged several suburban systems with the Wilmington public schools. Preliminary results, also received too late to be included in our review, show large black gains after desegregation (Green et al., 1981).

THE RACIAL COMPOSITION OF DESEGREGATED SCHOOLS

We also looked at the effectiveness of desegregation in schools of different racial compositions. We were guided by two findings from the literature. First, the various large-scale studies of schools found black achievement directly related to the percentage of whites in the school--the whiter the school, the higher the minority achievement. However, the National Opinion Research Center (1973) found a currilinear relationship. Over 80 percent white, minority scores fall. Table 7 shows the expected achievement gain, removing the effects of differences in methodology and grade of desegregation. Again, as in Table 6, the grand mean of the table is .3, and each

Table 7

DESEGREGATION EFFECT, BY PERCENTAGE OF WHITES IN DESEGREGATED SCHOOLS

(Size of effect [standard deviation] and number of samples)

Percentage of Whites	North	South
92 to 99	.30 (19)	.32 (12)
82 to 91	.43 (29)	.39 (8)
72 to 81	.24 (29)	.49 (7)
63 to 71	.27 (27)	.36 (20)
56 to 62	.18 (26)	.27 (10)
1 to 56	.30 (20)	.21 (33)
Total	.27 (143)	.33 (89)

entry is .3 (the "normal" effect of desegregation) plus the residual for this group of schools from the regression equation of Table 4.

We find similar patterns in both the North and the South. In the South, the pattern is quite clear and is statistically significant.* Achievement reaches a peak for schools between 72 and 81 percent white and drops off on either side in a reasonably steady manner. In the North, the pattern is more complex. The high point is at 82 to 91 percent, declining in both directions, but the decline is not completely even and the overall pattern is not statistically significant. The differences are not small. In the North, a school with a relatively small black population has achievement scores which are .1 of a standard deviation higher than schools with larger black populations. In the South, the difference is .2 standard deviations.

The finding that schools with smaller black populations have higher achievement can be explained in two ways. First, if the main effect of desegregation is to place low income children in schools with affluent students, the more white students the greater the average income level in the school. (We cannot test this directly, since none of the 93 studies reported the actual social class of either the black

*See fn., p. 14.

or white students.) Secondly, a smaller black population makes it more difficult to resegregate the school by creating an all-minority class of supposedly low-ability students. Presumably, such a segregated classroom would be detrimental to achievement.*

The finding that achievement is lower in the schools with the smallest percentage black population is also consistent with theory, as well as with the National Opinion Research Center study. The argument is simply that the overwhelmingly white school is a hostile environment for black students, because there are not enough black students and black teachers to provide the black students with the sense of being integrated into the school. The blacks, feeling like outsiders, would be inhibited from learning. (See Crain, Mahard, and Narot, 1982, for an elaboration of this argument.)

Civil rights advocates have frequently argued for the establishment of a "critical mass" of black students, insisting that desegregation plans not spread black students so thinly that they make up less than 15 percent or 20 percent of the school. These achievement results seem consistent with that request. At the same time, these data provide additional support for the metropolitan desegregation argument, for it is only with metropolitan desegregation that one can be guaranteed a large enough population of white students to provide for predominantly (but not overwhelmingly) white student bodies.

We also tested a few other plan characteristics, but found no other correlations with achievement. One important conclusion is a negative one: Issues related to voluntary versus mandatory desegregation and one-way versus two-way busing seem irrelevant. Mandatory plans and voluntary plans show approximately equal achievement gains. (In an earlier paper [Crain and Mahard, 1978b], we noted that mandatory plans seemed to show higher achievement gains. We were reluctant at that time to accept this as a firm finding and were apparently wise

*See Rosenbaum (1980) on the social and academic effects of homogeneous grouping. Morgan and McPartland (1980) find considerable internal segregation within desegregated schools, presumably as a result of assignment to homogeneous classrooms.

not to do so, since with the larger sample we cannot find any difference between the two types of plan.) We also can find no evidence that formerly black schools differ from formerly white schools in their achievement impact.

Few of the studies we reviewed describe the desegregation plan in any detail. Thus, we could not test other plan factors, such as staff desegregation, in-service training programs, tracking policies, and curriculum.

IV. CONCLUSIONS, INTERPRETATIONS, AND IMPLICATIONS

The research review in this report points to six general conclusions, the major one of which is

1. Desegregation raises achievement test scores for black students.

Three other conclusions specify the conditions under which desegregation is most effective in raising black achievement:

2. Desegregation is most beneficial for black students when it is begun in kindergarten or first grade.
3. Desegregation is most beneficial for black students when desegregated schools are predominantly, but not overwhelmingly, white.
4. Desegregation is most beneficial for black students when the entire metropolitan area is included.

These findings are quite consistent with the findings of the input-output literature; in particular, they are consistent with the hypothesis that the benefits of desegregation are the result of socioeconomic desegregation. Several input-output studies have shown that the presence of middle-class students in a school is the key factor in raising black achievement. Input-output studies have also shown that Hispanic minorities benefit from desegregation to the same degree that blacks do. The few local studies of Hispanic achievement in desegregated school districts also shows this, as does the input-output analysis of the National Longitudinal Study presented in Appendix B of this Note. This suggests that any low-income group will benefit academically from attending a school whose students are predominantly higher status, regardless of the ethnicity of either the higher-status or the lower-status group. This hypothesis has rarely been tested, but seems plausible.

The dependence of the academic effects of desegregation on socioeconomic integration would explain why black students benefit most when schools are predominantly white (there are usually more high-status students in schools where there are more whites) and in metropolitan desegregation plans (since high-status white students tend to live in suburbs, and low-status blacks in central cities).

One other finding suggests that academically successful desegregation requires the resolution of some racial issues. Black students do poorly in schools where they are a small minority, and this suggests that feelings of isolation and alienation may play a role. One input-output analysis of southern high schools (Crain, Mahard, and Narot, 1982) found black male students expressing considerable alienation in schools with a high percentage of whites. These findings all seem plausible. This review contains two other findings that are less plausible:

5. Desegregated black students show IQ gains that are as large as or larger than their achievement gains.
6. Desegregated black students do not show achievement gains in the later elementary school grades. The positive benefits of desegregation obtained in the early primary grades are maintained, but not enhanced, in later grades.

IMPLICATIONS FOR THEORY

Research to date seems to have settled the question of whether desegregation raises achievement, but it has done little to tell us why it does so. If it is true that the beneficial effects are due to socioeconomic mixing, then we must discard theories based explicitly on race. For example, the theory that blacks, perceiving segregation as a stigma, have lower self-esteem and aspirations seems not to fit the data. Hispanics, for whom segregation has less meaning, also benefit from desegregation. Furthermore, benefits for blacks are concentrated in the earliest grades, where racial attitudes are less developed. Similarly, there seems to be little support for the hypothesis that black association with middle-class white students

results in a transference of values about school work. There is little evidence to support the hypothesis of "lateral transmission of values" (see Patchen, Hoffman, and Brown, 1980). If such a transmission occurred, one would not expect it to occur mainly in the primary grades.

Future research on desegregated classrooms should address two questions:

1. How does the curriculum, defined in the broadest possible way, in desegregated schools differ from that of minority schools?

If curriculum were defined narrowly as the kinds of topics covered and materials used, it would be hard to argue that predominantly white schools were superior. This definition would imply that the special efforts to develop curricula appropriate to inner-city youth have been counterproductive. Similarly, inner-city schools have benefited from Title I funding; it is hard to argue that their facilities are inferior.

If curriculum and facilities are defined broadly, however, there may be merit to thinking of the middle-class school as superior. The white middle-class school may have a cognitively more complex environment. In a situation where achieving minimum performance in reading and arithmetic can be taken for granted, where disciplinary and motivational problems are less severe, and where teacher and student share a culture, teachers may feel free to innovate and to add new experiences to the school life. The curriculum may depart from cut-and-dried subjects and incorporate a much wider range of ideas and experience. This expanded environment may lead to gains in both tests of basic skills and tests of intelligence. We have no evidence for this, but the hypothesis seems reasonable and is consistent with one large research project done on compensatory education in the United States, which found that schools influenced by the English primary school movement had higher intelligence test gains on an abstract test of intelligence, while more conventional compensatory educational programs showed stronger gains in achievement (Stallings et al., 1974).

Desegregation in and of itself may be a cognitively enriching experience. For many students, desegregation raises many questions. Parents may be more concerned about what is happening at school. A student may have to learn to deal with other students whose use of language differs from his own. He may have to deal with his own fear or anger. In all of these activities, the student may be asking himself questions or being asked questions by others.

To the extent that intelligence is the ability to confront and solve a new problem (and to the extent that intelligence tests in fact measure this ability), then the more new problems the student confronts, the more he will stretch his mind to deal with them as they arise. Perhaps learning to cope with desegregation is good practice for learning to cope with an IQ test.

2. Do teachers have higher expectations for students in desegregated schools?

The hypothesis that students respond to the subtle cues of teachers who have high expectations, advanced first by Rosenthal and Jacobsen (1968), has been tested, with mixed results, many times since then. Applied to desegregation, the hypothesis holds that a teacher confronting a desegregated but predominantly white middle-class group of students paces the instruction faster, pulling the minority students along with the group. The concept has not been connected directly to desegregation, however, and this may be a promising approach.

The data analyzed here seem to point to a rather implausible finding: that students who are desegregated in early elementary grades show an immediate gain in achievement and that this gain is maintained but not enhanced in the upper elementary grades. If this finding is valid (and we are not at all sure that it is), it raises some important questions. What sort of educational intervention is desegregation if it benefits only very young children? It is difficult to imagine a mechanism of this type--one that raises achievement for minority students, but only through the age of 8 or 9. There is

a second possibility: Desegregation may have both positive and negative effects, the positive effects applicable to children of all ages, but its negative effects only to children in middle and late elementary school. It is not difficult to imagine a mechanism of the second type--a negative effect of desegregation, large enough to cancel its positive effects and beginning at around the age of 8 or 9. One possibility is that teacher expectations for desegregated black students may change as the students reach the upper grades of elementary schools when a more clearly defined achievement gap between blacks and whites appears and the beginnings of misbehavior among black students depress teacher expectations. The track system may also explain the negative effects of desegregation. Tracking is more common with older students. Being placed in the bottom achievement classroom of a desegregated school may be as harmful educationally as remaining in a segregated school.

Desegregated black students may also be harmed in later elementary school grades because their white classmates have developed more negative racial attitudes at that age (although this hypothesis does not seem to agree with such studies as that done by the National Opinion Research Center [1973], which find little evidence of bad race relations in elementary school), or because they and their white classmates have developed a greater sensitivity to achievement differences.

Another, equally likely possibility, is that the finding in these data is wrong. Few studies of desegregation measure its effects later than the second year; perhaps if we had more long-term studies, we would find a continuous cumulative effect of desegregation.

Even if desegregation begun in kindergarten or first grade were to have a continuous and cumulative effect on minority achievement, there remains the other finding in this study, which is supported by considerable research--that desegregation initiated during middle or late elementary school has no short-run beneficial achievement effects. This means that even if desegregation is beneficial during these years, there is some factor which makes beginning the process at this time a bad idea. One possible explanation for this is

suggested by research on migration. Students in later elementary grades are in an age range that Michael Inbar (1976) called the *vulnerable age*. Inbar found that migrants to Israel between the ages of 6 and 11 were less likely to attend college later than those who went at either younger or older ages. He replicated this result using migration to Canada and regional migration within the United States. Crain and Weisman (1972) found a similar pattern for blacks who migrated from the South to the North at this age. Inbar theorizes that the elementary school years are an important period of establishing social relationships. If this theory is correct, the social migration that occurs with desegregation may have negative effects analogous to those of geographic migration.

IMPLICATIONS FOR PUBLIC POLICY

These findings imply that some types of desegregation plans are preferable to others. A desegregation plan includes more than a formula for reassigning students. The courts require desegregation of school staffs. Desegregation planners recommend in-service training programs for staff and programs of community relations and parent involvement; they oppose the grouping of students by ability within schools. Many school districts include a revision of the curriculum and creation of magnet schools in their desegregation plan. This analysis does not address these components of the plan (although, obviously, if desegregation benefits minority achievement, the assignment of students to racially homogeneous classrooms within a desegregated school is probably harmful).

The analysis in this Note has implications for pupil assignment formulas, but we must not exaggerate the utility of our findings. Pupil assignment plans are not drawn solely for the purposes of enhancing minority achievement. They are drawn, first, to eliminate illegal segregation of students, and courts have established guidelines for what is required to do this. Often, they are also drawn so as to minimize white flight, or to create new educational opportunities in the form of magnet schools. A good desegregation plan should also encourage residential desegregation, so that the plan will

gradually reduce the number of students who need to be reassigned to nonneighborhood schools. A policy analysis of desegregation plans should consider these needs as well, and this is beyond the scope of this Note.

Finally, we should stress that the analysis presented here is based largely on the effects of desegregation on black achievement; they may not be applicable to Hispanic-Anglo desegregation, or desegregation in communities containing several ethnic groups.

With these caveats in mind, our findings that black achievement is enhanced in predominantly, but not overwhelmingly, white schools and in metropolitan plans have implications for pupil-assignment policy. These implications differ depending on the school system's racial composition.

Communities whose schools are between 15 percent and 50 percent black. We have in mind districts that are predominantly, but not overwhelmingly, white; 15 percent and 50 percent are only approximate boundaries for this category. Most desegregation plans have been drawn in this kind of community. Typically, these school systems are desegregated with a reassignment plan that sets all schools equal in their racial mix. Normally, this is done at least partly with mandatory reassignment; in very small cities, it is sometimes possible to accomplish this with an entirely voluntary plan (Rossell, 1981).

Our review of the research indicates that these plans are likely to be effective in raising black achievement. In cities where a sizable number of middle-class whites live outside the school district, or where the percentage minority is close to 50 percent, a metropolitan plan is preferable, since this brings more affluent students into the desegregated schools and insures that schools remain predominantly white.

Communities whose schools are less than 15 percent black. Traditional desegregation policy in these communities distributes black students equally throughout the schools. There are obvious reasons to do so; it creates a kind of equity in that all white communities receive equal "burdens"; and it loads most of the burden of busing onto black children. But the findings of this study suggest an

alternative: to desegregate black schools only with middle-class white schools. Thus, the black enrollment would not fall too low in any school and more blacks would benefit from being in school with middle-class whites.

Communities over 50 percent black. Courts have perceived a dilemma in desegregating predominantly black school districts, and this review identifies another aspect of that dilemma. The application of a traditional desegregation plan, in which all schools have the same racial mix, makes every school predominantly black, and buses white students most of their years of schooling.* Both factors greatly increase white flight. Courts have often resolved this dilemma by desegregating only a portion of the black community, holding the desegregated schools to a 50-50 racial mix rather than allowing them to become predominantly black. Obviously, such a plan deprives many black students of the benefits of desegregation. This review complicates the dilemma further by finding that desegregation with predominantly black schools, while academically beneficial, does not help minority achievement as much as desegregation when schools have a majority of white students.

The only escape from this dilemma is metropolitan desegregation, involving enough suburban white districts to bring the overall ratio of whites up to 50 percent or more. If metropolitan desegregation is impossible, the findings of the achievement review add a bit more weight to the partial desegregation argument. The latter is not an overriding argument; the decision about how to desegregate predominantly black school districts will remain, as it is now, a matter of weighing competing values.

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*In a typical desegregation plan, every minority student spends the same number of years riding buses to school in white neighborhoods, and the fraction of the 12 years that they are bused is approximately equal to the percentage of whites or the district enrollment. Conversely, the fraction of years that the average white student is bused is equal to the percentage of minorities in the district. For example, in a district which is 25 percent minority, whites will ride the bus three years (25 percent of 12) and minorities nine years. In a 75 percent minority district, the ratios reverse, and whites ride nine years out of twelve.

Voluntary one-way transfer programs to suburbs offer an important policy option. Some states already have legislation to permit this option. Although central city administrations, central city teachers unions, and some central city black political leaders oppose such transfers, suburban school administrators with declining enrollments, integrationist groups in the suburbs, and black parents themselves often support this solution. While this is hardly a substitute for court-ordered metropolitan desegregation, it is a reasonable first step that can be taken without waiting for the courts. Because this policy has little opposition from the traditional antibusing groups that have frightened so many school boards, it is a policy that some school systems may want to follow as a way to demonstrate their willingness to at least take partial steps toward desegregation.

We have little research on what happens inside desegregated schools, but one finding seems relevant and potentially of great importance. In elementary schools where desegregation is especially successful in raising black achievement, test scores in reading and language arts gain especially. This finding suggests that successful desegregated schools may concentrate more on this part of the curriculum. More research is needed.

IMPLICATIONS FOR EDUCATIONAL RESEARCH

Science, it is often said, is a cumulative process, and each research paper makes a small contribution to the accumulation of scientific knowledge. Although the many students who wrote doctoral dissertations about school desegregation during the past 20 years may not have expected that the advent of high speed computers and the development of meta-analysis would enable their work to make a contribution to this kind, this is exactly what happened. The overall pattern of results of these studies was obscured by methodological errors that in many cases could not be avoided. Because of these methodological errors, it was impossible from a quick reading of the studies to determine even whether desegregation benefited minority achievement or not. But once reasonable estimates have been derived for the correction factors necessitated by inadequate methodology, a clear pattern emerges.

We can see from this analysis that desegregation is indeed beneficial, although it must begin in the earliest grades. We have also seen what research has led us to suspect for some time--that desegregation in a predominantly white society requires predominantly white schools and that desegregation in a society where whites have moved to the suburbs, leaving declining central cities to the black minority, requires a metropolitan desegregation plan. We have also learned some unexpected things, such as that black students do not achieve as well in a school in which more than 80 percent of the students are white. This finding confirms that up to now had been a largely speculative argument for a "critical mass" of black students in desegregated schools.

Much more work remains to be done. Our findings that desegregation enhances IQ test scores as much or more than it does achievement test scores calls into question many assumptions about the meaning of intelligence and invites us to think more about why desegregation is beneficial. Similarly, the finding that the success of desegregation depends peculiarly on reading comprehension and language art scores invites researchers to think further about this issue.

Many of the studies reported here are doctoral dissertations. These studies provide extremely valuable scientific data in an area lacking government research support. However, many of the faculty advisers for these studies seem to have urged their students to adopt a tight experimental design. The experimental tradition in psychology has been a source of both the strengths and weaknesses of desegregation research. From that tradition, those engaged in such research have borrowed a sophisticated methodology. Unfortunately, they have failed to realize that in going from the laboratory to the real world they have lost control of the intervention. No two desegregation plans are alike; often they are not even similar; thus, one has little reason to expect identical "treatment effects" of desegregation.

Many dissertations leave no room for reporting a mass of useful descriptive data. In many cases, they fail to report the actual racial composition of the desegregated school. In only one case could we find any discussion of the kind of curriculum used in the desegregated schools. Furthermore, most such studies contain no discussion

of the community reaction to desegregation, although research (Crain and Mahard, 1980) indicates that the amount of controversy is related positively to the success of desegregation. In general, dissertations written by school district staff offer more in this regard, perhaps because these are written by older students with real-world experience.

The evaluation of Goldsboro by Mayer, King, Borders-Patterson, and McCullough (1974) stands out as a study of desegregation because of the completeness of the data--even to maps of the plan. This report deals with the desegregation planning process, community reaction, the logistics of the plan, staff preparation, reactions of students to each other, and changes in teaching methods. Other dissertations reported entire sets of raw data in appendixes. Given the enormous change in the efficiency of computers, it is now possible to reanalyze those data at surprisingly low cost. The growth of interest in case-survey analysis, accompanied by the increasing availability of dissertations from University Microfilms and of unpublished research reports through ERIC, means that the chances of dissertations or school district reports being added to our cumulative store of knowledge is increasing. We hope that students and researchers keep this in mind in the future.

Case-survey analysis and meta-analysis are valuable in part because they are alternatives to traditional studies of education. When two different methods obtain comparable results, users of each method can have more confidence in their results. In this case, reassuringly, findings from the analysis of studies of induced desegregation closely parallel the results of studies that simply correlate achievement against school racial mix, and the distinction between "artificial" and "natural" desegregation itself becomes artificial. This implies that we can take the input-output results more seriously and devote more energy to reanalysis of major input-output studies, such as the National Longitudinal Studies, so as to identify desegregated schools' characteristics that correlate with higher black achievement.

Appendix A

THE 93 STUDIES OF BLACK ACHIEVEMENT

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Appendix B

DESEGREGATION AND HISPANIC ACHIEVEMENT

Our review disclosed little research on the effect of desegregation on the achievement of Hispanic students. The desegregation of such cities as Los Angeles, with large numbers of Mexican-Americans and other Hispanics, suggests the desirability of expanding our perspective to include these minorities.

Although the research seems to indicate that blacks benefit from desegregation, its effect on other minorities was not known. Given the diversity among Hispanics, there also seems to be little reason to expect a consistent effect among different Hispanic groups. We found only one technically adequate study of a specific desegregation plan: Morrison (1972) studied Anglo-American, Mexican-American, and black achievement in a large urban school system (probably Houston). He found Mexican-American achievement to be higher in desegregated schools. When Hispanics were first desegregated in the third grade, the desegregated group had lower test scores than those in segregated schools; by the eighth grade, they were slightly over one year ahead. Desegregation had a more beneficial effect for Hispanics than for blacks (see Morrison, 1972, viii and 120). To fill the knowledge gap here, we undertook a regression analysis of the relationship between school racial composition and Hispanic student achievement. Such an analysis had been done once before. The Coleman report (Coleman et al., 1966, Table 3.23, p. 310) found higher Hispanic achievement test scores in schools with more white students. The effects for Puerto Ricans were stronger than those for Mexican-Americans. We decided to replicate this analysis, using data from a national sample of Hispanic students. The material presented here is excerpted from a larger study (Mahard and Crain, 1980), which measured the effect of desegregation on college attendance as well.

DESCRIPTION OF DATA AND MEASURES

The National Longitudinal Survey (NLS) of the high school class of 1972 contains data on 23,451 high school seniors drawn from 1318 high schools. Data for the present analysis come from the baseline (Spring 1972) survey. The NLS sampled 986 Hispanic students from 312 schools, 72 percent of whom identified themselves as Mexican-American or Chicano, 13 percent as Puerto Rican, and 16 percent as "other Latin American." The majority of these students (78 percent) attended high school in the South or the West.

The analysis was conducted separately by region. Puerto Ricans from the South and the West and northern Mexican-Americans were eliminated at the outset because of small sample sizes. The small number of other Latins precluded separate analyses by region. Thus, final analyses are restricted to four groups: southern Mexican-Americans, western Mexican-Americans, northern Puerto Ricans, and other Latins from all regions combined.

Achievement is measured by a test taken during the senior year of high school. The achievement value for each student represents the mean of the reading, vocabulary, and mathematics subtests, with each subtest weighted so as to contribute equal variance to the overall score.

The percentage of Anglo students in each high school was constructed for about 90 percent of our schools from data in DHEW's *Directory of Public Elementary and Secondary Schools: Staff and Student Race/Ethnicity, 1972*. Control variables for the analyses are individual student socioeconomic status, predominant language spoken at home, and school size. The SES index pools information on parents' education, family income, father's occupation, and the existence of various household items. The individual components are standardized so that each carries approximately equal weight in the scale. Predominant language was measured by asking students, Is English the language spoken most often in your home? A high score is associated with a yes response. School size, taken from the NLS School Questionnaire, represents the total senior class enrollment for the 1971-1972 school year.

METHOD

The analyses of achievement and college attendance were conducted using ordinary least squares. Only cases with complete data on all variables in a given regression were used to estimate that equation. Means and standard deviations for achievement and the percentage of high school Anglo students are reported in Table B.1. For comparison

Table B.1

MEANS AND STANDARD DEVIATIONS OF DEPENDENT AND INDEPENDENT VARIABLES

	Achievement	School Percentage Anglo
Hispanics		
Mexican-Americans, South		
Mean	1.24	30.8
Standard deviation	.83	21.9
Mexican-Americans, West		
Mean	1.09	50.6
Standard deviation	.80	26.9
Puerto Ricans, North		
Mean	1.15	20.1
Standard deviation	.63	24.4
Other Latins, all regions		
Mean	1.35	56.0
Standard deviation	.86	35.8
Blacks		
South		
Mean	.99	40.1
Standard deviation	.80	30.4
West		
Mean	1.21	34.9
Standard deviation	.80	29.7
North		
Mean	1.19	40.5
Standard deviation	.88	32.6
Anglos		
South		
Mean	1.87	78.6
Standard deviation	.85	19.8
West		
Mean	1.84	83.4
Standard deviation	.83	16.9
North		
Mean	1.96	92.1
Standard deviation	.87	14.5

purposes, we also present the data for all the black students and a 20 percent sample of the Anglo students surveyed in the NLS. Note the fairly wide range of school racial compositions. Puerto Ricans are the most segregated of the groups, with an average school composition of 20 percent Anglo. Other Latins are the least segregated--the average member of this group attends a school which is 56 percent Anglo.

RESULTS

Table B.2 presents the results of the achievement analyses. Achievement is significantly higher in predominantly Anglo schools for three of the four groups. Western Mexican-Americans, Puerto Ricans, and other Latins show standardized percentage Anglo coefficients of .136, .190, and .337, respectively. The coefficient for southern

Table B.2

STANDARDIZED COEFFICIENTS FOR REGRESSION OF ACHIEVEMENT OF HIGH SCHOOL RACIAL COMPOSITION

(Standardized regression coefficients [β] and 0-order correlation coefficients [r])

	Mexican-Americans				Puerto Ricans		Other Latins	
	South		West		North		All Regions	
	β	r	β	r	β	r	β	r
SES	.257[a]	.253	.119[b]	.165	.131	.158	.328[a]	.425
English	.044	.125	.044	.098	-.206	-.224	-.170	-.005
School size	-.041	.018	.012	.034	.215	.239	.130	.127
School % Anglo	-.068	.004	.136[b]	.172	.190[c]	.131	.337[a]	.313
R^2	.070		.048		.143		.262	
(n)	(152)		(262)		(63)		(91)	

[a] $p < .01$.

[b] $p < .05$.

[c] $p < .10$.

Mexican-Americans is nonsignificant and negative--attendance at a predominantly Anglo school may be associated with lower achievement.

In terms of the control variables, SES yields the only consistent results among groups--higher SES students have higher achievement. Neither language nor school size appears to affect the achievement of Mexican-Americans. English as the predominant language is negatively associated with the achievement of Puerto Ricans and other Latins--students who report speaking English at home most of the time have somewhat lower achievement. This finding has appeared in other studies and is not as surprising as it appears. In many cases, parents in English-speaking households are not schooled in English, and they sometimes speak a grammatically incorrect hybrid language disparagingly referred to as "Spanglish." Finally, Puerto Ricans and other Latins have higher achievement in larger schools.

One important caution: These data do not permit us to argue with any certainty that the patterns we have observed are in fact due to desegregation. In the absence of an experimental design, counter-arguments of self-selection cannot be easily dismissed. We are also concerned that these data do not permit controls on characteristics of the community. The apparent benefits of desegregation may be simply because Hispanics in predominantly white schools are located in smaller communities, for example. We are also concerned that the NLS contains data only for seniors. If the drop-out rate is higher from desegregated schools, the surviving seniors would have higher test scores than Hispanic seniors in segregated schools, but this would not mean that desegregation was academically beneficial. Nevertheless, the pattern is somewhat reassuring. Regression analyses of national populations have shown black achievement higher in predominantly white schools, and studies of specific desegregation plans indicate that desegregation raises black test scores. Regression analysis of national data, and one study of a specific desegregation plan, show the same pattern for Hispanic students. It is too early to conclude that desegregation affects black and Hispanic achievement in the same way, but there is some evidence pointing to this conclusion.

Appendix C

DESEGREGATION AND INTELLIGENCE TEST SCORES

We have found twelve studies of the effect of desegregation on achievement. Each is described below. Two studies were done using a genuine randomized experimental design implemented by Thomas Mahan to evaluate a voluntary central city-suburban desegregation plan in Hartford. The better analysis is by Wood (1968). A group of 313 segregated black students in kindergarten through the fifth grade were compared with 232 students assigned to desegregated schools. The verbal portion of the Wechsler Intelligence Scale for Children (WISC) was administered to each group at the beginning and end of the 1968-1969 school year. Wood found significant IQ gains for the desegregated students, with the exception of males in grades 4 and 5.

If students cannot be randomly assigned to desegregation and segregated schools, the next best alternative is to select a control group from students in segregated schools who are approximately equal in ability and social background. Two studies were able to go a step further, controlling on the willingness to attend desegregated schools by selecting students who were on the waiting lists for desegregation. This presumably is a good way to control on differences in motivation between students who want to go to desegregated schools and those who do not; it leaves open questions about why these students were passed over on the waiting list or why they were late in applying.

Beker (1967) evaluated the effects of desegregation on a group of students who transferred in 1964 from a segregated school to a nearly all-white school in a university neighborhood. More students applied for transfer than could be accommodated, and those on the waiting list were used as a control group. Gains appeared in achievement but not IQ; the desegregated third-grade group (age 8) gained four points on the Lorge-Thorndike test relative to the control group, but desegregated first and second graders each lost one point. The sample sizes are very small (only 8 to 26 in each cell), and we are especially suspicious of the first grade results. The desegregated

group's IQ went up 11 points, whereas the control group's IQ scores went up to 12 points, indicating a negative effect of desegregation.

Rentsch (1967) studied the effects of a free-choice transfer plan adopted by the Rochester, New York, school board in 1964. Fifty-four students who transferred were compared with 54 control students who were matched on sex, attendance, and tardiness and who had applied for transfers but been refused because of lack of space. While this is perhaps the best available method for eliminating differences in motivation between the two groups, it did not completely succeed. Rentsch notes that the transferred students had higher grades (p. 154) and were "probably a select subgroup of the total who applied" (p. 103).

Students were tested with the Otis Test of Mental Ability before school began and again after one year of desegregation. The desegregated students in the first, third, and fourth grades scored higher; those in the second grade (age 7) showed no difference; and those in the fifth grade (age 10) showed losses compared with the segregated group. With small sample sizes, none of the differences were significant.

When one cannot select students from a waiting list for desegregation, the next best alternative is to find students of roughly the same ability and social class living in another neighborhood or town whose school is segregated. One can then argue that the fact that the school was segregated was only a minor factor in the host of variables that explain why some families lived in one neighborhood and some in the others. This is essentially the approach used in three studies.

Meketon (1966) studied the IQ scores of black fifth- and sixth-graders in a desegregated school (n = 29). She attempted to match these students with 29 students of similar background and IQ in a segregated school. One year after desegregation, all students completed a test of digit span, as well as short versions of the verbal meaning and spacial ability sections of Thurstone's original Chicago Test of Primary Mental Abilities. Students in the desegregated school showed nonsignificant losses on all subtests relative to the control students.

Griffin (1969) studied the impact of desegregation on 32 black third- to fifth-grade students in Tulsa, Oklahoma. These students were desegregated in 1967, when their all-black elementary school was closed. A control group of identical size and similar background and achievement was selected from a segregated school. Kuhlman-Anderson scores were used for pre- and posttests. After one year of desegregation, the desegregated students had gained seven IQ points relative to the controls, a statistically significant effect.

Van Every (1969) studied the desegregation of a white, middle-income school in Flint, Michigan. The school was desegregated in Fall 1967, when a public housing project was built in the neighborhood. Kuhlman-Anderson IQ scores for 22 desegregated and 22 segregated black students were compared before and two years after desegregation. Students who were 10 years old at the time of initial desegregation were matched on socioeconomic background and achievement level. Treatment students showed a mean predesegregation IQ score of 89.64; control students scored 91.77. Two years later, treatment students had gained 3.8 IQ points, while their segregated counterparts had gained 1.8 points (this difference was not statistically significant).

Williams (1968) analyzed the relation between desegregation and IQ in one Florida high school. Verbal and quantitative IQ scores were taken from the Florida statewide test administered in the ninth and twelfth grades. The Fall 1964 pretest was administered to 71 black students, all of whom were attending a segregated high school. In Fall 1965, 29 of these students volunteered to transfer to a predominantly white high school, while the others (n = 42) remained in the segregated school; both groups were retested two years later. Ordinarily this would be a poor design, but in this particular case the researcher was able to show that not only were their intelligence test scores identical before desegregation, the verbal test scores of the segregated and desegregated students remained the same during three years of desegregation, while at the same time the quantitative ability test scores of the desegregated students went up by nearly one standard deviation.

On verbal intelligence, treatment students showed an initial mean score of 17.85 and control students a mean of 19.4. By Fall 1967, desegregated students averaged 19.05 (posttest s.d. = 7.36) and segregated students a mean of 19.00 (posttest s.d. = 10.15). Thus, the desegregated students gained 1.6 verbal IQ points relative to the segregated students, or approximately .2 of a standard deviation. This difference was not statistically significant. On quantitative IQ, treatment students averaged 16.1 before desegregation and control students 15.95. The average posttest score was 20.4 for treatment students (s.d. = 7.15) and 15.8 for control students (s.d. = 5.2). Thus, in the course of the study, the desegregated students gained 4.3 IQ points, while the segregated students lost .15 points, or approximately .9 of a control group standard deviation. But the stability of the verbal ability test scores suggests that whatever psychological or social factors influenced some students to volunteer for desegregation while others did not were probably not in this case related to either verbal cognitive ability or any academic motivational factors that would have affected future verbal cognitive ability.

We found seven other studies that are methodologically weaker. For example, at the same time that Meketon and Beker were each doing reasonably sound studies of desegregation in one school, they each also analyzed the effects of desegregation in a second school where conditions were methodologically less favorable.

Meketon matched the segregated school from her study described above to a second desegregated school. Unfortunately, the two schools used different IQ tests; the desegregated school, using the California Test of Mental Maturity (CTMM), obtained a higher pretest score. Meketon reviews studies that compare the CTMM to the Otis used in the control school and concludes that the higher score is an artifact of poor test norming. She posttested students in both schools and found higher scores in the desegregated school. If she is correct that the pretest scores indicate that the two populations are similar, then the students in the desegregated school experienced a considerable gain in IQ.

Beker studied a group of students who transferred from an all-black school to one which was 8 percent black. Compared with a group of students who remained in another all-black school, the transferred students showed gains of two points (grade 1), six points (grade 2), and five points (grade 3). While there are no obvious methodological problems here, there is always the possibility that the desegregated and segregated groups differed in some important respect.

Three studies done in communities where all schools were desegregated could not use segregated students as controls. In these cases, the basic method was to compare the test scores of all minority students after desegregation to the score of minority students who had been in the same grades before desegregation. Since the students who were in the first grade in the year before desegregation were born before the students who were first graders after desegregation, these studies essentially compare different cohorts of students. Such studies cannot allow for the possibility that there is a secular increase or decline in test performance, or that the conditions of administration may differ from one year to the next.

Bundren (Clark County School District, 1975) compared IQ scores of all black students before and after desegregation of schools in Las Vegas, Nevada. In Fall 1972, black elementary school students were mandatorily reassigned to previously white schools. The preceding Spring, second and fifth graders (n = 661 and 588, respectively) had taken the Otis-Lennon Mental Ability Test. The same test was administered two years later to the second- and fifth-grade cohorts (n = 750 and 805).

Bundren found a relative loss of one point for the desegregated second grade and a relative gain of one point for the desegregated fifth-graders. Neither difference was statistically significant. The study has two drawbacks. First, no information is provided equating the background and previous achievement of the two cohorts. A second, more serious problem is that the "segregated" cohort was not completely segregated. According to U.S. government statistics (Office for Civil Rights, 1972), 60 percent of the minority students were in predominantly white schools before the desegregation plan took effect.

We reanalyzed the data in the third study and were able to construct a rather complex cohort analysis to replace the analysis that the author had originally done. Carrigan (1969) had simply looked at IQ scores before and after desegregation for one group of students and compared them with the scores of students in another school in which the racial mix was not changed and which she considered segregated. Because the second school was in fact 50 percent white, we thought this comparison inappropriate. However, Carrigan reported sufficient data to enable us to compare cohorts of students before and after desegregation and, at the same time, to compare cohorts of students in the 50 percent-white school in order to adjust for any change in test administration over time which might have affected both schools. In this case, the newly desegregated student body achieved higher IQ scores than students in the same neighborhood before desegregation and than the later cohort of black students in the 50 percent-white school. We concluded that desegregation had had a positive effect on intelligence in the kindergarten and first and second grades because the students in the newly desegregated schools achieved higher test scores than an earlier cohort. This was not true for students desegregated in the next three older grades.

Two studies had no control group of segregated students and simply reported IQ scores before and after desegregation or after two or three years (rather than one year) of desegregation. Such studies would have merit if one were willing to assume that IQ tests were accurately normed so that their mean of 100 and standard deviation of 15 would be a reasonable standard by which to measure student performance. In fact, Meketon has pointed out that comparisons made between the Otis and California Test of Mental Maturity found consistent differences of as much as 12 IQ points between the two tests. Norming a test on a large standard population is quite expensive, and few test publishers have done this. In addition, these tests have not been normed on black populations. For this reason, we think that any change in IQ for a group of students from one year to the next may reflect a bias introduced by a change in the level of the test used, the inappropriateness of the same level of test for students of

different ages, or differences in administration. Thus, we consider the studies cited next as being of least importance in our review.

Taylor (1974) tracked the IQ scores of 220 black students in Hillsborough County (Tampa), Florida. Students were desegregated in Fall 1971 as they began the fourth grade. The Otis-Lennon test was administered at that time and again in Fall 1973, after students had experienced two years of desegregated schooling. Taylor reports a gain of 6.5 IQ points following desegregation.

Moorehead (1972) administered the Wechsler Test to first-, second-, and third-graders in three newly desegregated schools in northern Mississippi. Their respective mean scores were 82, 87, and 89. Moorehead reasons that the higher scores in the upper grades are an indication that desegregation elevates intelligence test scores. To eliminate one source of bias, she also tested the students in these three cohorts who were not in these grades because they had failed a grade or been assigned to special education classes. However, in the absence of data showing constant test scores for segregated students in these three grades, her conclusion seems tenuous.

Finally, our last study is an analysis of Project Concern conducted by Mahan and Mahan (1971). They studied the change in desegregated students in the Hartford experiment during the second year of the demonstration, mainly because the first-year test administration had missed a number of students and possibly introduced a bias. Since this sample to a great extent overlaps the sample studied by Wood, it would seem unfair to allow this one group of students to count twice in our evaluation. For that reason, we have assigned this technically excellent study the lowest priority.

The results of these 12 studies are summarized in Table C.1. The studies are ranked in the same order in which they were described. The table shows the grade at which the students were desegregated, the type of design, and the effect in IQ points. In some cases, differences in IQ points were derived by deciphering an analysis of variance. In the case of the Williams study, the Florida test used there did not produce scores with an expected mean of 100 and standard deviation of 15. The effect of desegregation is estimated by assuming that an IQ test for this population would have a standard deviation of 15.

Table C.1

RESULTS OF 13 STUDIES OF DESEGREGATION AND BLACK IQ GAINS

Location	Grade	Method	Effect (IQ)	Source
Hartford, Connecticut	K-1	Randomized	4.5[a,b]	Wood (1969)
	2-3		5.5[a,b]	
	4-5		4.0[a,b]	
Syracuse, New York	1	Longitudinal	-1.1[c]	Beker (1967)
	2		-.6[c]	
	3		3.7[c]	
	1		1.6	
	2		5.9	
	3		5.0	
Rochester, New York	1	Longitudinal	1.2[c]	Rentsch (1967)
	2		0[b]	
	3		6.6[c]	
	4		.4[c]	
	5		-2.5[c]	
Kentucky	5-6	Longitudinal	-4.5[c]	Meketon (1966)
	5-6		7.3	
Tulsa, Oklahoma	3	Longitudinal	7.2[a,c]	Griffin (1969)
	4		7.2[a,c]	
	5		6.2[a,c]	
Flint, Michigan	5	Longitudinal	2.0[c]	Van Every (1969)
Brevard Co., Florida	10	Longitudinal	10.7[a,c]	Williams (1968)
Clark Co., Nevada	2	Cohort	-1	Bundrin (Clark Co., 1970)
	5		1	
Ann Arbor, Michigan	K	Cohort	5.2	Carrigan (1969)
	1		3.4	
	2		2.4	
	3		-3.9	
	4		-4.2	
	5		-1.6	
Hillsborough Co., Fla.	4	Norms	6.5[a]	Taylor (1974)
Mississippi (northeast)	1	Cohort	5	Moorehead (1972)
	1		7[a]	
Hartford, Connecticut	K	Randomized	6.0[a,b]	Mahan and Mahan (1968)
	1		1.3[b]	
	2		4.7[b]	
	3		7.6[a,b]	
	4		-1.2[b]	
	5		.4[b]	

[a] $p < .05$.

[b] Methodologically strongest studies.

[c] Methodologically second strongest studies.

The strongest studies methodologically, the experimental design analyzed by Wood and Mahan, shows IQ gains in eight of nine cases and a median gain of four points. The fourteen samples from the next strongest studies show positive effects of desegregation nine times and a median gain of less than two points. Although most of the sample sizes are quite small, the Wood, Griffin, and Williams studies show positive gains that are statistically significant. The lower portion of the table presents, in addition to the Mahan results, the results of the four studies that we consider methodologically weaker. These four studies, together with the technically weak substudies by Beker and Meketon, yield a total of fifteen samples; nine of the fifteen show positive gains in excess of two points, four show changes of less than two points either way, and only two show losses in excess of two points. Overall, these studies show a median effect of just over three points.

While overall these 12 studies are not as well done as we might wish, the consistency of their findings is encouraging. It seems reasonable to conclude that the typical desegregation plan enhances black scores on intelligence tests as well as achievement tests.

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